

TOTAL MAXIMUM DAILY LOAD (TMDL)

For

Dissolved Oxygen, Biological Oxygen Demand

And

Nutrients/Unionized Ammonia

In the

Elevenmile Creek

(WBID 489)

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LIST OF ABBREVIATIONS

AWT	Advanced Waste Treatment
BMP	Best Management Practices
BPJ	Best Professional Judgment
CFS	Cubic Feet per Second
CFU	Colony Forming Units
DEM	Digital Elevation Model
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
FAC	Florida Administrative Code
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LA	Load Allocation
MGD	Million Gallons per Day
MOS	Margin of Safety
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer Systems
NASS	National Agriculture Statistics Service
NLCD	National Land Cover Data
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OSTD	Onsite Sewer Treatment and Disposal Systems
PLRG	Pollutant Load Reduction Goal
Rf3	Reach File 3
RM	River Mile
STORET	STORage RETrieval database
TBN	Total Bioavailable Nitrogen
TBP	Total Bioavailable Phosphorus
TMDL	Total Maximum Daily Load
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WBID	Water Body Identification
WCS	Watershed Characterization System
WLA	Waste Load Allocation
WMP	Water Management Plan

SUMMARY SHEET

Total Maximum Daily Load (TMDL)

1. 303(d) Listed Waterbody Information

State: Florida

Major River Basin: Perdido River (HUC 03100208)

1998 303(d) Listed Waterbodies for TMDLs addressed in this report:

WBID	Segment Name and Type	County	Constituents(s)
489	Eleven Mile Creek (freshwater)	Escambia	Dissolved Oxygen (DO), Nutrients, Biochemical Oxygen Demand (BOD)

2. TMDL Endpoints (i.e., Targets) and Approach

Biochemical Oxygen Demand (BOD) shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions. 62-302.530(21), F.A.C.

Nutrients shall be limited as needed to prevent violations of other standards contained in this chapter. In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. See 62-302.530(48)(a) and 62-302.530(48)(b), F.A.C.

This TMDL does not propose load reductions that would abate natural conditions in Elevenmile Creek (WBID 489). As set out in more detail below, EPA believes the Creek will not attain Florida's water quality standard for dissolved oxygen even in the absence of all anthropogenic sources of pollutants that affect dissolved oxygen. Allocations for DO/BOD and Nutrient TMDLs in WBID 489 (Elevenmile Creek) are shown below.

Parameter	WLA	LA
Total Nitrogen	0.74 mg/l	0.74 mg/l
Total Phosphorus	0.06 mg/l	0.06 mg/l
Biochemical Oxygen Demand (BOD)	3.5 mg/l	4.2 mg/l

Note: For these TMDLs, it is not possible to estimate the daily loads due the lack of flow data. However, in order to calculate a daily load, multiply the TMDL concentration by the daily flow and appropriate conversion factors.

4. Endangered Species (yes or blank):

5. EPA Lead on TMDL (EPA or blank): EPA

6. TMDL Considers Point Source, Nonpoint Source, or both: Both

EPA believes Elevenmile Creek is naturally below the applicable water quality standard for dissolved oxygen without anthropogenic sources. While this TMDL does not propose loads to abate that natural condition, there is no assimilative capacity available in the Creek for a nutrient or BOD load allocation or wasteload allocation above natural background conditions.

1 Introduction

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology-based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not meeting water quality standards. The TMDL process establishes the allowable loadings of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and in-stream water quality conditions, so that states can establish water quality based controls to reduce pollution from both point and non-point sources and restore and maintain the quality of their water resources (USEPA, 1991).

The State of Florida Department of Environmental Protection (FDEP) has developed 303(d) lists since 1992. The process by which Florida implements section 303(d) requirements is set forth in the Florida Watershed Restoration Act (FWRA) of 1999 (s. 403.067, Florida Statutes). The FDEP list of impaired waters in each basin, referred to as the “Verified List”, is also adopted pursuant to the FWRA (Subsection 403.067[4], Florida Statutes). However, the FWRA also states that all previous Florida 303(d) lists were for planning purposes only and directed the Department to develop, and adopt by rule, a new science-based methodology to identify impaired waters. After a long-rule-making process, the Florida Environmental Regulation Commission adopted the new methodology as Chapter 62-303, Florida Administrative Code (Identification of Impaired Surface Waters Rule, or IWR), in April 2001. The TMDLs developed in this report are for impaired waters that are on the 1998 303(d) list but not the verified list. They are being proposed pursuant to EPA commitments in the 1998 Consent Decree in the Florida TMDL lawsuit (Florida Wildlife Federation, et al. v. Carol Browner, et al., Civil Action No. 4: 98CV356-WS, 1998).

FDEP developed a statewide, watershed-based approach to water resource management. Following this approach, water resources are managed on the basis of natural boundaries, such as river basins, rather than political boundaries. The watershed management approach is the framework DEP uses for implementing TMDLs. The state’s 52 basins are divided into 5 groups. Water quality is assessed in each group on a rotating five-year cycle. The Group 5 basin includes waters in the basins of the Everglades, Florida Keys, Indian River Lagoon, Perdido, Springs Coast, and Upper East Coast. Group 5 waters were first assessed in 2004 with plans to revisit water management issues in 2009. FDEP established five water management districts (WMD) responsible for managing ground and surface water supplies in the counties encompassing the districts. Elevenmile Creek is located in the Northwest Florida Water Management District (NFWFMD).

For the purpose of planning and management, the WMDs divided the district into planning units defined as either an individual primary tributary basin or a group of adjacent primary tributary basins with similar characteristics. These planning units contain smaller, hydrological based units called drainage basins, which are further divided into “water segments”. A water segment usually contains only one unique waterbody type (stream, lake, canal, etc.) and is about 5 square miles. Unique numbers or waterbody identification (WBIDs) numbers are assigned to each water segment.

2 Problem Definition

Florida's final 1998 Section 303(d) list identified WBIDs in the Perdido River Basin as potentially not supporting water quality standards (WQS). This document addresses the nutrient, biochemical oxygen demand (BOD) and dissolved oxygen (DO) listings for WBID 489, Elevenmile Creek (Table 2-1). The geographic location of this WBID is shown in Figure 3-1.

Table 2-1 TMDLs Developed by EPA for Elevenmile Creek

WBID	Name	Planning Unit	Parameter of Concern
489	Elevenmile Creek	Perdido Bay	DO/BOD and Nutrients

The format of the remainder of this report is as follows: Chapter 3 is a general description of the impaired watershed; Chapter 4 describes the water quality standard and target criteria for the TMDL; and Chapter 0 describes the development of the TMDL, including the source assessment, data assessment, and analytical approach.

3 Watershed Description

The Elevenmile Creek watershed is located in Escambia County, Florida with a 47.97 square-mile drainage area which reaches from Cantonment to Perdido Bay (Figure 3-1). Elevenmile Creek is about 13 miles long. Elevenmile Creek is a fourth order stream fed by the sand and gravel aquifer. Additional information about the stream’s hydrology and geology are available in the Basin Status Report for the Perdido Basin (Florida Department of Environmental Protection [FDEP], 2006).

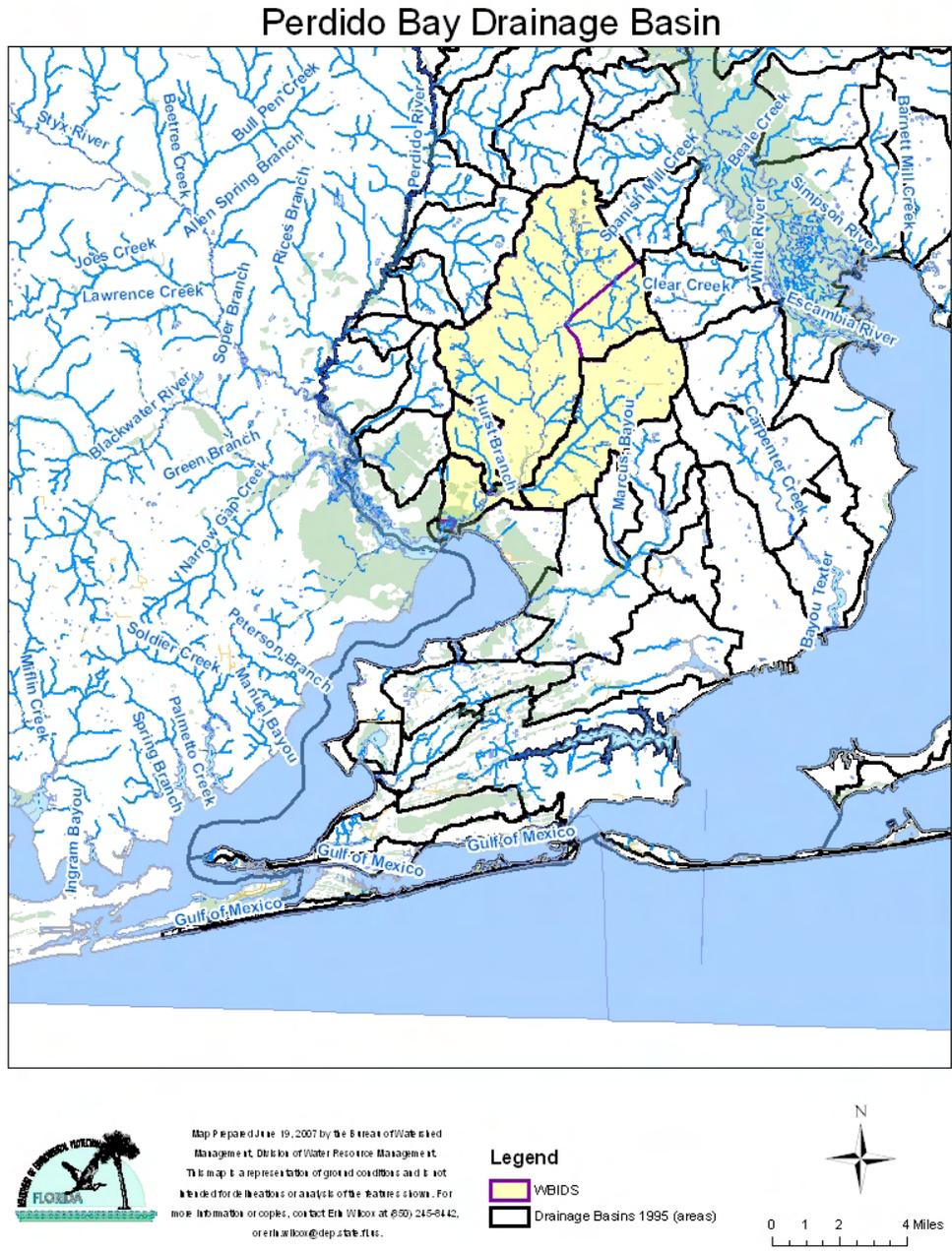


Figure 3-1 Elevenmile Creek Watershed in Florida, and Major Geopolitical Features

The spatial distribution and acreage of different land use categories were identified using the 1995 Northwest Florida Water Management District land use coverage (scale 1:40,000) contained in the Department's GIS library. Land use categories in the watershed were aggregated using the simplified Level 1 codes tabulated in Table 3-1. Figure 3-2 show the acreage of the principal land uses in the watershed (Level 2 is used in the figures to present the watershed's land use in more detail than the Level 1 tables). As shown in Table 3-1, land use in the Elevenmile Creek Watershed is heavily dominated by upland forests, which comprises 47.7 percent of the entire WBID. Other non-natural land uses in the watershed include transportation, communication and utilities (3.43 percent) and agriculture (3.08 percent).

Table 3-1 Classification of Land Use Categories in the Elevenmile Creek Watershed

Code	Land Use	Acreage	Square Miles	Percent of Watershed
WBID 489	Elevenmile			
1000	Urban and Built Up	5270.4457	8.2351	28.5740
2000	Agriculture	1976.4778	3.0883	10.7156
3000	Rangeland	383.2642	0.5989	2.0779
4000	Upland Forests	7698.8924	12.0296	41.7400
5000	Water	259.1061	0.4049	1.4048
6000	Wetlands	2203.1812	3.4425	11.9447
7000	Barren Land	19.2332	0.0301	0.1043
8000	Transportation, Communication and Utilities	634.2768	0.9911	3.4388
TOTAL		18444.8774	28.8205	100.0001

Elevenmile Creek Basin Land Use Level 2

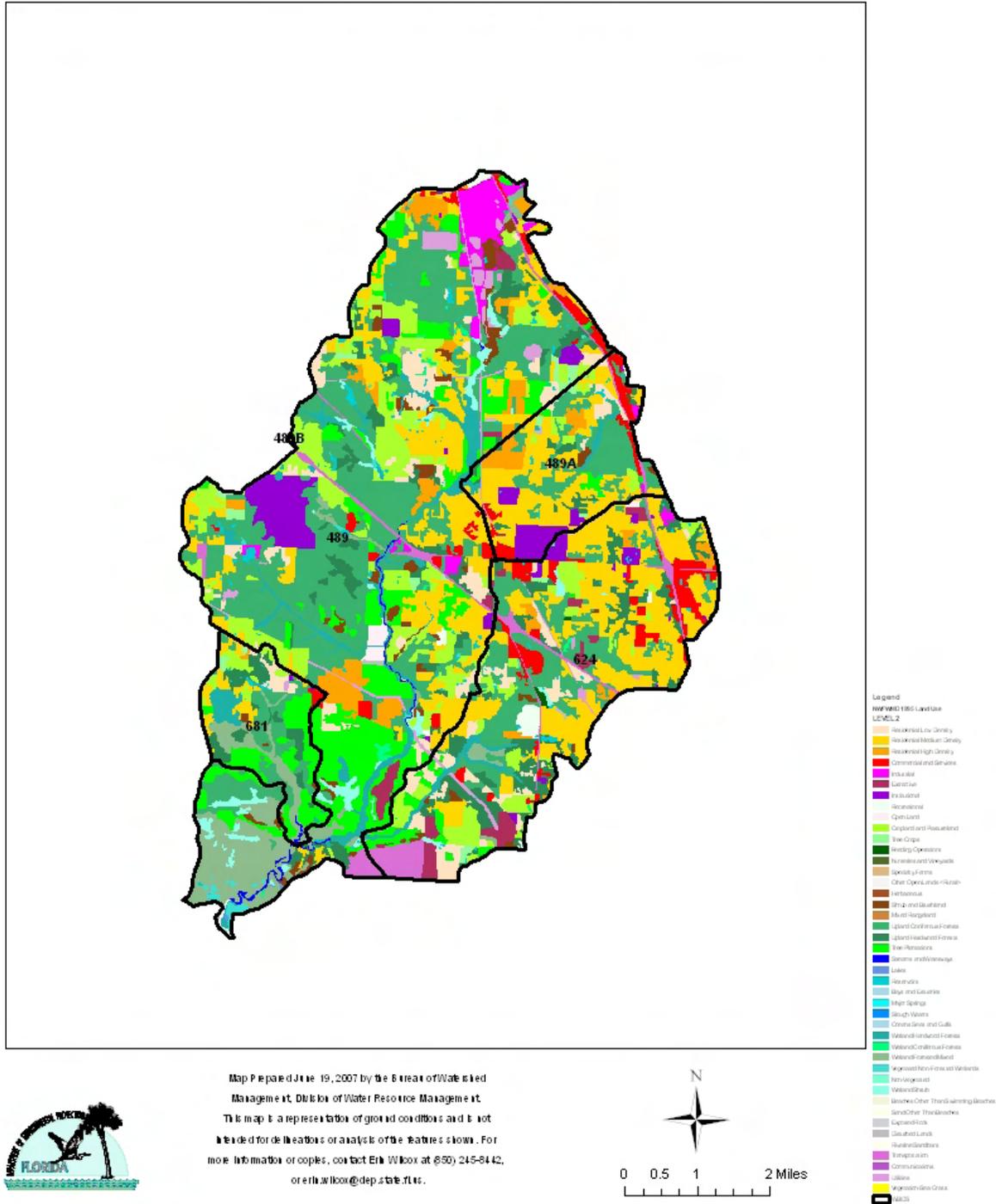


Figure 3-2 Principal Land Uses in the Elevenmile Creek Watershed

4 Water Quality Standards and Target Identification

Florida's surface waters are protected for five designated use classifications, as follows:

Class I	Potable water supplies
Class II	Shellfish propagation or harvesting
Class III	Recreation, propagation, and maintenance of a healthy, well-balanced population of fish and wildlife
Class IV	Agricultural water supplies
Class V	Navigation, utility, and industrial use (there are no state waters currently in this class)

Waterbodies in WBID 489 are classified as Class III freshwaters, with a designated use of recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife.

The water quality criteria for protection of Class III waters are established by the State of Florida in, Section 62-302.530 of the Florida Administrative Code (F.A.C.). The individual criteria should be considered in conjunction with other provisions in water quality standards, including Section 62-302.500 F.A.C. [Surface Waters: Minimum Criteria, General Criteria] that apply to all waters unless alternative criteria are specified in F.A.C. Section 62-302.530. In addition, unless otherwise stated, all criteria express the maximum not to be exceeded at any time. While the State of Florida does not have numeric criteria for nutrients, a narrative criterion exists as described below. The specific criteria that apply to WBID 489 are:

4.1 Nutrients (Freshwater)

The designated use of Class III waters is recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. FDEP has not adopted a numeric nutrient criterion for Class III waters. Therefore, the Class III narrative criterion applies to Elevenmile Creek:

The discharge of nutrients shall continue to be limited as needed to prevent violations of other standards contained in this chapter. Man induced nutrient enrichment (total nitrogen and total phosphorus) shall be considered degradation in relation to the provisions of Section 62-302.300, 62-302.700, and 62-4.242, FAC. 62-302.530(48)(b), F.A.C.

In no case shall nutrient concentrations of a body of water be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. 62-302.530(48)(b), F.A.C.

Because the State of Florida does not have numeric criteria for nutrients, chlorophyll and DO levels are used to indicate whether nutrients are present in excessive amounts.

4.2 Dissolved Oxygen

Freshwater: Dissolved Oxygen (DO) shall not be less than 5.0 (milligrams/liter). Normal daily and seasonal fluctuations above these levels shall be maintained. 62-302.530(31),

F.A.C.

4.3 Biochemical Oxygen Demand (Freshwater)

Biochemical Oxygen Demand (BOD) shall not be increased to exceed values which would cause dissolved oxygen to be depressed below the limit established for each class and, in no case, shall it be great enough to produce nuisance conditions. 62-302.530(12), F.A.C.

4.4 Unionized Ammonia

Less than or equal to 0.02 mg/l ammonia

4.5 Natural Conditions

In addition to the standards for nutrients, DO and BOD described above, Florida's standards include provisions that address waterbodies which do not meet the standards due to natural background conditions.

Florida's water quality standards provide a definition of natural background:

“Natural Background” shall mean the condition of waters in the absence of man-induced alterations based on the best scientific information available to the Department. The establishment of natural background for an altered waterbody may be based upon a similar unaltered waterbody or on historical pre-alteration data. 62-302.200(15), FAC.

Florida's water quality standards also provide that:

Pollution which causes or contributes to new violations of water quality standards or to continuation of existing violations is harmful to the waters of this State and shall not be allowed. Waters having water quality below the criteria established for them shall be protected and enhanced. However, the Department shall not strive to abate natural conditions. 62-302.300(15) FAC

5 Assessment of Sources

5.1 Types of Sources

An important part of the TMDL analysis is the identification of pollutant source categories, source subcategories, or individual sources of nutrients in the watershed and the amount of pollutant loading contributed by each of these sources. Sources are broadly classified as either “point sources” or “nonpoint sources.” Historically, the term point sources has meant discharges to surface waters that typically have a continuous flow via a discernable, confined, and discrete conveyance, such as a pipe. Domestic and industrial wastewater treatment facilities (WWTFs) are examples of traditional point sources. In contrast, the term “nonpoint sources” was used to describe intermittent, rainfall driven, diffuse sources of pollution associated with everyday human activities, including runoff from urban land uses, agriculture, silviculture, and mining; discharges from failing septic systems; and atmospheric deposition.

However, the 1987 amendments to the Clean Water Act redefined certain nonpoint sources of pollution as point sources subject to regulation under the EPA’s National Pollutant Discharge Elimination Program (NPDES). These nonpoint sources included certain urban stormwater discharges, including those from local government master drainage systems, construction sites over five acres, and a wide variety of industries.

To be consistent with Clean Water Act definitions, the term “point source” will be used to describe traditional point sources (such as domestic and industrial wastewater discharges) AND stormwater systems requiring an NPDES stormwater permit when allocating pollutant load reductions required by a TMDL (see Section 6.1). However, the methodologies used to estimate nonpoint source loads do not distinguish between NPDES stormwater discharges and non-NPDES stormwater discharges, and as such, this source assessment section does not make any distinction between the two types of stormwater.

5.2 Potential Sources in Elevenmile Creek

5.2.1 Point Sources

There is currently one permitted wastewater treatment facility (Figure 5-1) that discharges loads either directly or indirectly into the Elevenmile Creek. International Paper (former owners include Champion Paper, St. Regis, and Florida Pulp & Paper) is an industrial pulp mill that has discharged to the headwaters of the creek near Cantonment since 1939 (EPA, 1988). The Cantonment wastewater treatment plant (WWTP) was a domestic facility that discharged to the headwaters of the creek just upstream of SR 186 until May 20, 1998 (Table 5-1). These facilities were permitted through the NPDES Program in Florida. When examining the long term trends of the Elevenmile Creek system, we have included (where possible) the loads from formerly active facilities. Another permitted facility is the Beulah Landfill, located in the Coffee Creek basin, north of the USGS stream gage at US 90.

The EPA (1988) has summarized the history of the mill treatment system from 1939-1988, while Livingston (1998) has also summarized mill treatment from 1958-1998 along with various water quality studies of Elevenmile Creek and Perdido Bay.

Table 5-1 Point Sources in the Elevenmile Creek Watershed

Permit Number	Facility Name	City	Type of Facility	Facility Status	Design Capacity (mgd)	Watershed	WBID
FL0002526	International Paper	Cantonment	Industrial	Active	24	Elevenmile Creek	489
FL0038504	Cantonment WWTP	Cantonment	Domestic Waste	Inactive	1.228	Elevenmile Creek	489
FLR05A334	Beulah Landfill	Escambia County	Solid Waste	Closed		Coffee Creek	489

Elevenmile Creek Basin Facilities

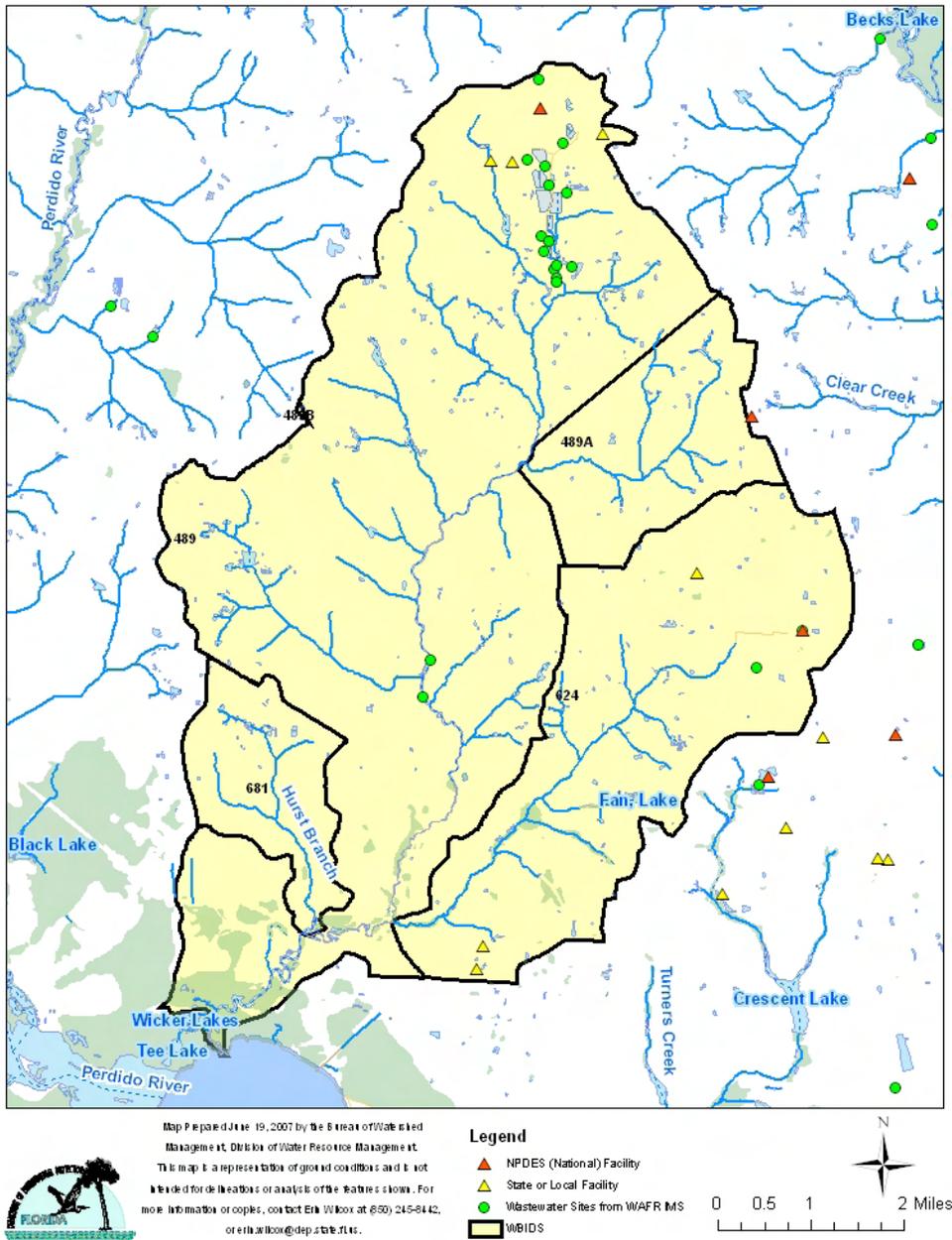


Figure 5-1 Wastewater Facilities in the Elevenmile Creek Watershed

6 Water Quality Data Assessment

6.1 Water Quality Data and Sampling Stations

Excessive nutrients in a waterbody can lead to overgrowth of algae and other aquatic plants such as phytoplankton, periphyton and macrophytes. This process can deplete oxygen in the water, adversely affecting aquatic life and potentially restricting recreational uses such as fishing and boating.

While the State of Florida does not have numeric criteria for nutrients, a narrative criterion exists as described in the Water Quality Standards section of this report. Chlorophyll and dissolved oxygen are used to indicate whether nutrients are present in excessive amounts. For Class III fresh waters, the dissolved oxygen should not be less than 5.0 mg/l.

Table 6-1 provides a list of the monitoring stations in WBID 489. Each station is identified, and the time period of record for the individual stations is provided. Data collected at these monitoring stations during the Group 5 listing cycle (i.e. January 1999 through December 2005) or after are considered in the data assessment and TMDL analysis. However, when no recent data are available for a particular parameter, data collected prior to 1997 are considered. The original data are included in the Administrative Record for this report, and are also available upon request. Explanations of data remark codes are provided in Appendix A.

Table 6-1 Water Quality Stations in WBID 489 Elevenmile Creek

Station	Station Name	First Date	Last Date	# Obs
21FLA 33010010	11 MILE CREEK SR 186 ST REGIS EF	4/27/1995 11:00	10/31/1996 12:43	2
21FLA 33010011	11 MILE CREEK AT SR 297A BR	4/30/1995 13:50	10/31/1996 21:30	9
21FLA 33010013	11 MILE CR AT HWY 90 BR	4/30/1995 22:44	4/30/1995 22:44	1
21FLA 33010018	TRIB TO 11MILE CR AT 297A S OF ESC.CO RD PRISON	10/31/1996 11:29	10/31/1996 11:29	1
21FLA 33010043	11 MILE CREEK 800 YDS ABOVE MOUT	4/25/1994 12:45	10/18/1994 11:09	9
21FLA 33010045	11 MILE CR 300 YDS N. HWY 186	10/31/1996 18:04	10/31/1996 18:04	1
21FLA 33010046	11 MILE CREEK 15 YARDS N OF SR18	10/31/1996 13:50	10/31/1996 13:50	1
21FLBFA 33010011	11 MILE CREEK AT SR 297A BR	3/6/1994 11:00	5/7/2006 13:15	155
21FLBFA 33010014	11 MI CR 1/2 MI BELO SAUFLEY FLD	3/6/1994 15:00	6/1/1997 11:35	27
21FLBRA 489-A	Elevenmile Creek - at 297A and 97A junction	5/16/2006 10:57	6/27/2006 15:47	8
21FLBRA 489-B	Elevenmile Creek - At Kingsfield	5/16/2006 12:33	6/27/2006 16:12	8
21FLBRA 489-C	Elevenmile Creek - at US-90A	5/16/2006 14:30	6/27/2006 14:58	8
21FLBRA 489-D	Elevenmile Creek - at US-90	6/27/2006 12:59	6/27/2006 12:59	4
21FLGW 3565	ELEVENMILE CREEK NEAR WEST PENSACOLA	10/20/1998 12:45	6/23/2006 17:49	192
21FLPNS 33010011	11 MILE CREEK at SR 297A Bridge	3/5/2005 8:00	6/12/2006 12:00	16
21FLPNS 33010012	Eleven Mile Creek at Hwy 90A	3/17/2005 10:19	12/20/2005 13:48	8
21FLPNS 33010013	Eleven Mile Creek at Highway 90 Bridge	3/17/2005 11:55	6/12/2006 13:30	24
21FLPNS 33010040	Elevenmile Creek 500 Yards from Mouth	3/29/2005 12:14	9/12/2005 11:16	8
21FLPNS 33010041	Eleven Mile Creek 1700 Yards above Mouth	9/12/2005 11:00	9/12/2005 11:00	4
21FLPNS 33010093	Eleven Mile Creek 1700 Yards above Mouth	6/12/2006 11:29	6/12/2006 11:29	4

Station	Station Name	First Date	Last Date	# Obs
21FLPNS 33010105	Eleven Mile Creek--WBID 489-10	3/17/2005 10:54	3/17/2005 10:54	4
21FLPNS 330148915	Eleven Mile Creek--WBID 489-15	3/28/2005 10:44	3/28/2005 10:44	3
21FLPNS 330148916	Eleven Mile Creek--WBID 489-16	3/28/2005 11:49	3/28/2005 11:49	3
21FLPNS 330148917	Eleven Mile Creek--WBID 489-17	3/28/2005 12:30	12/20/2005 12:34	7
21FLPNS 330148921	Tributary to Eleven Mile Creek @ Turtle Pond	3/28/2005 10:15	3/28/2005 10:15	4
21FLPNS 33014895	Eleven Mile Creek--WBID 489-5	9/12/2005 10:40	9/12/2005 10:40	4

6.1.1 Nutrients and Chlorophyll

Chlorophyll is the green pigment in plants that allows them to create energy from light. In a water sample, chlorophyll is indicative of the presence of algae, and chlorophyll-*a* is simply a measure of the active portion of total chlorophyll. The measured chlorophyll-*a* concentrations in Elevenmile Creek is presented in Figure 6-1. The mean value is 5.6 µg/l (+- 1.5 µg/l). Chlorophyll- *a* concentrations are relatively low and do not exhibit nuisance or imbalance of flora and fauna. This is primarily due to the darkness of the waters in Elevenmile Creek. The measurements for the individual stations in Elevenmile Creek for Chlorophyll a, Total Nitrogen and Total Phosphorus are presented in Table 6-2 - Table 6-5.

Table 6-2 Chlorophyll a Elevenmile Creek (WBID 489)

Station ID	Station Name	#Obs	Mean	Minimum	Maximum	Exceeden	Median	First Date	Last Date
21FLA 3301001	11 MILE CREEK AT SR 297A BR	1	5	5	5	0	5	7/16/1995 13:50	7/16/1995 13:50
21FLBFA 3301001	11 MILE CREEK AT SR 297A BR	15	5.28	5	9.2	0	5	5/4/2003 14:15	5/7/2006 13:15
21FLBRA 489-A	489 - Elevenmile Creek - at 297A and 97A junction	2	6.9	5.8	8	0	6.9	5/16/2006 10:57	6/27/2006 15:47
21FLBRA 489-B	489 - Elevenmile Creek - At Kingsfield	2	7.25	3.5	11	0	7.25	5/16/2006 12:33	6/27/2006 16:12
21FLBRA 489-C	489 - Elevenmile Creek - at US-90A	2	6.3	2.6	10	0	6.3	5/16/2006 14:30	6/27/2006 14:58
21FLBRA 489-D	489 - Elevenmile Creek - at US-90	1	2.9	2.9	2.9	0	2.9	6/27/2006 12:59	6/27/2006 12:59
21FLPNS 3301001	11 MILE CREEK at SR 297A Bridge	4	5	5	5	0	5	3/5/2005 8:00	6/12/2006 12:00
21FLPNS 3301001	Eleven Mile Creek at Hwy 90A	2	5	5	5	0	5	3/17/2005 10:19	12/20/2005 13:48
21FLPNS 3301001	Eleven Mile Creek at Highway 90 Bridge	6	5	5	5	0	5	3/17/2005 11:55	6/12/2006 13:30
21FLPNS 3301001	Elevenmile Creek 500 Yards from Mouth	2	5	5	5	0	5	3/29/2005 12:14	9/12/2005 11:16
21FLPNS 3301001	Eleven Mile Creek 1700 Yards above Mouth	1	5	5	5	0	5	9/12/2005 11:00	9/12/2005 11:00
21FLPNS 3301001	Eleven Mile Creek @ Hwy 186 Cantonment STP (remd	1	5	5	5	0	5	6/12/2006 11:29	6/12/2006 11:29
21FLPNS 3301001	Eleven Mile Creek--WBID 489-10	1	5	5	5	0	5	3/17/2005 10:54	3/17/2005 10:54
21FLPNS 3301489	Eleven Mile Creek--WBID 489-15	1	5	5	5	0	5	3/28/2005 10:44	3/28/2005 10:44
21FLPNS 3301489	Eleven Mile Creek--WBID 489-16	1	5	5	5	0	5	3/28/2005 11:49	3/28/2005 11:49
21FLPNS 3301489	Eleven Mile Creek--WBID 489-17	2	5	5	5	0	5	3/28/2005 12:30	12/20/2005 12:34
21FLPNS 3301489	Tributary to Eleven Mile Creek @ Turtle Pond	1	7.6	7.6	7.6	0	7.6	3/28/2005 10:15	3/28/2005 10:15
21FLPNS 3301489	Eleven Mile Creek--WBID 489-5	1	5	5	5	0	5	9/12/2005 10:40	9/12/2005 10:40

Table 6-3 Corrected Chlorophyll a Elevenmile Creek (WBID 489)

Station ID	Station Name	#Obs	Mean	Minimum	Maximum	Exceeden	Median	First Date	Last Date
21FLA 3301001	11 MILE CREEK AT SR 297A BR	1	5	5	5	0	5	7/16/1995 13:50	7/16/1995 13:50
21FLBFA 3301001	11 MILE CREEK AT SR 297A BR	14	5.19	5	7.6	0	5	5/4/2003 14:15	5/7/2006 13:15
21FLBRA 489-A	489 - Elevenmile Creek - at 297A and 97A junction	2	3.1	2.6	3.6	0	3.1	5/16/2006 10:57	6/27/2006 15:47
21FLBRA 489-B	489 - Elevenmile Creek - At Kingsfield	2	3.1	2.6	3.6	0	3.1	5/16/2006 12:33	6/27/2006 16:12
21FLBRA 489-C	489 - Elevenmile Creek - at US-90A	2	3.95	2.6	5.3	0	3.95	5/16/2006 14:30	6/27/2006 14:58
21FLBRA 489-D	489 - Elevenmile Creek - at US-90	1	2.6	2.6	2.6	0	2.6	6/27/2006 12:59	6/27/2006 12:59
21FLGW 17366	NWD-SL-1006 UNNAMED LAKE	1	1	1	1	0	1	4/2/2003 11:00	4/2/2003 11:00
21FLGW 17373	NWD-SL-1015 UNNAMED LAKE	1	1	1	1	0	1	5/12/2003 13:44	5/12/2003 13:44
21FLGW 3565	ELEVENMILE CREEK NEAR WEST PENSACOLA	80	1.46	1	7.5	0	1	10/19/1999 14:00	6/23/2006 16:44
21FLPNS 3301001	11 MILE CREEK at SR 297A Bridge	4	5	5	5	0	5	3/5/2005 8:00	6/12/2006 12:00
21FLPNS 3301001	Eleven Mile Creek at Hwy 90A	2	5	5	5	0	5	3/17/2005 10:19	12/20/2005 13:48
21FLPNS 3301001	Eleven Mile Creek at Highway 90 Bridge	6	5	5	5	0	5	3/17/2005 11:55	6/12/2006 13:30
21FLPNS 3301001	Elevenmile Creek 500 Yards from Mouth	2	5	5	5	0	5	3/29/2005 12:14	9/12/2005 11:16
21FLPNS 3301001	Eleven Mile Creek 1700 Yards above Mouth	1	5	5	5	0	5	9/12/2005 11:00	9/12/2005 11:00
21FLPNS 3301001	Eleven Mile Creek @ Hwy 186 Cantonment STP (remd	1	5	5	5	0	5	6/12/2006 11:29	6/12/2006 11:29
21FLPNS 3301001	Eleven Mile Creek--WBID 489-10	1	5	5	5	0	5	3/17/2005 10:54	3/17/2005 10:54
21FLPNS 3301489	Eleven Mile Creek--WBID 489-15	1	5	5	5	0	5	3/28/2005 10:44	3/28/2005 10:44
21FLPNS 3301489	Eleven Mile Creek--WBID 489-16	1	5	5	5	0	5	3/28/2005 11:49	3/28/2005 11:49
21FLPNS 3301489	Eleven Mile Creek--WBID 489-17	2	5	5	5	0	5	3/28/2005 12:30	12/20/2005 12:34
21FLPNS 3301489	Tributary to Eleven Mile Creek @ Turtle Pond	1	5.6	5.6	5.6	0	5.6	3/28/2005 10:15	3/28/2005 10:15
21FLPNS 3301489	Eleven Mile Creek--WBID 489-5	1	5	5	5	0	5	9/12/2005 10:40	9/12/2005 10:40

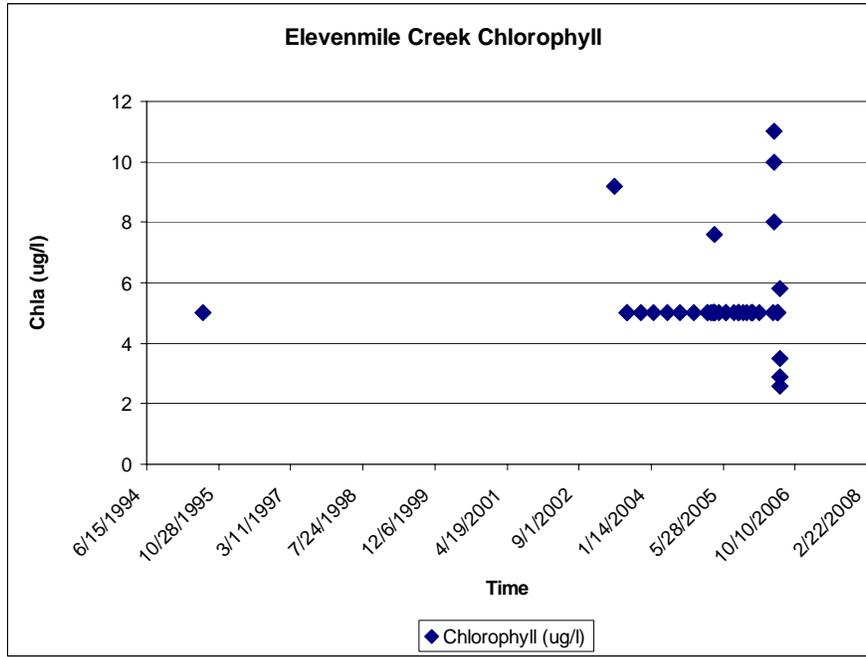


Figure 6-1 Chlorophyll a Measurements in Elevenmile Creek

Table 6-4 Total Nitrogen Elevenmile Creek (WBID 489)

Station ID	Station Name	#Obs	Mean	Minimum	Maximum	Exceeden	Median	First Date	Last Date
21FLA 3301001	11 MILE CREEK SR 186 ST REGIS EF	1	4.1	4.1	4.1	0	4.1	4/27/1995 11:00	4/27/1995 11:00
21FLA 3301001	11 MILE CREEK AT SR 297A BR	3	4.43	2.9	6.11	0	4.27	4/30/1995 13:50	2/15/1996 21:30
21FLA 3301001	11 MILE CR AT HWY 90 BR	1	2.3	2.3	2.3	0	2.3	4/30/1995 22:44	4/30/1995 22:44
21FLBFA 3301000	11 MILE CREEK AT SR 297A BR	65	5.28	1.54	11.26	0	5.31	3/6/1994 11:00	5/7/2006 13:15
21FLBFA 3301000	11 MI CR 1/2 MI BELO SAUFLEY FLD	14	2.78	0.48	4.1	0	2.83	3/6/1994 15:00	6/1/1997 11:35
21FLBRA 489-A	489 - Elevenmile Creek - at 297A and 97A junction	2	6.21	6.05	6.36	0	6.21	5/16/2006 10:57	6/27/2006 15:47
21FLBRA 489-B	489 - Elevenmile Creek - At Kingsfield	2	0.5	0.44	0.57	0	0.5	5/16/2006 12:33	6/27/2006 16:12
21FLBRA 489-C	489 - Elevenmile Creek - at US-90A	2	5.02	4.34	5.7	0	5.02	5/16/2006 14:30	6/27/2006 14:58
21FLBRA 489-D	489 - Elevenmile Creek - at US-90	1	4.99	4.99	4.99	0	4.99	6/27/2006 12:59	6/27/2006 12:59
21FLGW 17366	NWD-SL-1006 UNNAMED LAKE	1	0.35	0.35	0.35	0	0.35	4/2/2003 11:00	4/2/2003 11:00
21FLGW 17373	NWD-SL-1015 UNNAMED LAKE	1	0.46	0.46	0.46	0	0.46	5/12/2003 13:44	5/12/2003 13:44
21FLGW 3565	ELEVENMILE CREEK NEAR WEST PENSACOLA	93	4.65	0.45	7.68	0	4.5	10/20/1998 12:45	6/23/2006 16:44
21FLPNS 3301000	11 MILE CREEK at SR 297A Bridge	3	6.17	4.7	7.06	0	6.76	3/5/2005 8:00	6/14/2005 10:30
21FLPNS 3301000	Eleven Mile Creek at Hwy 90A	1	3.96	3.96	3.96	0	3.96	3/17/2005 10:19	3/17/2005 10:19
21FLPNS 3301000	Eleven Mile Creek at Highway 90 Bridge	4	2.59	2.03	3.1	0	2.61	3/17/2005 11:55	12/7/2005 12:05
21FLPNS 3301000	Elevenmile Creek 500 Yards from Mouth	2	2.38	2.3	2.46	0	2.38	3/29/2005 13:15	9/12/2005 11:16
21FLPNS 3301000	Eleven Mile Creek 1700 Yards above Mouth	1	2.5	2.5	2.5	0	2.5	9/12/2005 11:00	9/12/2005 11:00
21FLPNS 3301000	Eleven Mile Creek--WBID 489-10	1	4.54	4.54	4.54	0	4.54	3/17/2005 10:54	3/17/2005 10:54
21FLPNS 330148	Eleven Mile Creek--WBID 489-15	1	7.73	7.73	7.73	0	7.73	3/28/2005 11:45	3/28/2005 11:45
21FLPNS 330148	Eleven Mile Creek--WBID 489-16	1	0.46	0.46	0.46	0	0.46	3/28/2005 12:49	3/28/2005 12:49
21FLPNS 330148	Eleven Mile Creek--WBID 489-17	1	0.66	0.66	0.66	0	0.66	3/28/2005 13:30	3/28/2005 13:30
21FLPNS 330148	Tributary to Eleven Mile Creek @ Turtle Pond	1	0.55	0.55	0.55	0	0.55	3/28/2005 11:15	3/28/2005 11:15
21FLPNS 330148	Eleven Mile Creek--WBID 489-5	1	2.6	2.6	2.6	0	2.6	9/12/2005 11:16	9/12/2005 11:16

Table 6-5 Total Phosphorus Elevenmile Creek (WBID 489)

Station ID	Station Name	#Obs	Mean	Minimum	Maximum	Exceeden	Median	First Date	Last Date
21FLA 3301001	11 MILE CREEK SR 186 ST REGIS EF	1	0.3	0.3	0.3	0	0.3	4/27/1995 11:00	4/27/1995 11:00
21FLA 3301001	11 MILE CREEK AT SR 297A BR	3	0.51	0.21	0.84	0	0.49	4/30/1995 13:50	2/15/1996 21:30
21FLA 3301001	11 MILE CR AT HWY 90 BR	1	0.1	0.1	0.1	0	0.1	4/30/1995 22:44	4/30/1995 22:44
21FLBFA 330100	11 MILE CREEK AT SR 297A BR	65	0.52	0.07	1.5	0	0.47	3/6/1994 11:00	5/7/2006 13:15
21FLBFA 330100	11 MI CR 1/2 MI BELO SAUFLEY FLD	14	0.31	0.03	0.59	0	0.32	3/6/1994 15:00	6/1/1997 11:35
21FLBRA 489-A	489 - Elevenmile Creek - at 297A and 97A junction	2	0.39	0.35	0.43	0	0.39	5/16/2006 10:57	6/27/2006 15:47
21FLBRA 489-B	489 - Elevenmile Creek - At Kingsfield	2	0.02	0.02	0.02	0	0.02	5/16/2006 12:33	6/27/2006 16:12
21FLBRA 489-C	489 - Elevenmile Creek - at US-90A	2	0.32	0.28	0.35	0	0.32	5/16/2006 14:30	6/27/2006 14:58
21FLBRA 489-D	489 - Elevenmile Creek - at US-90	1	0.37	0.37	0.37	0	0.37	6/27/2006 12:59	6/27/2006 12:59
21FLGW 17366	NWD-SL-1006 UNNAMED LAKE	1	0.01	0.01	0.01	0	0.01	4/2/2003 11:00	4/2/2003 11:00
21FLGW 17373	NWD-SL-1015 UNNAMED LAKE	1	0.03	0.03	0.03	0	0.03	5/12/2003 13:44	5/12/2003 13:44
21FLGW 3565	ELEVENMILE CREEK NEAR WEST PENSACOLA	93	0.37	0	0.84	0	0.34	10/20/1998 12:45	6/23/2006 16:44
21FLPNS 330100	11 MILE CREEK at SR 297A Bridge	3	0.37	0.36	0.38	0	0.38	3/5/2005 8:00	6/14/2005 10:30
21FLPNS 330100	Eleven Mile Creek - at Hwy 90A	1	0.22	0.22	0.22	0	0.22	3/17/2005 10:59	3/17/2005 10:19
21FLPNS 330100	Eleven Mile Creek at Highway 90 Bridge	4	0.17	0.14	0.19	0	0.17	3/17/2005 11:55	12/7/2005 12:05
21FLPNS 330100	Elevenmile Creek 500 Yards from Mouth	2	0.13	0.1	0.15	0	0.13	3/29/2005 13:15	9/12/2005 11:16
21FLPNS 330100	Eleven Mile Creek 1700 Yards above Mouth	1	0.13	0.13	0.13	0	0.13	9/12/2005 11:00	9/12/2005 11:00
21FLPNS 330101	Eleven Mile Creek--WBID 489-10	1	0.27	0.27	0.27	0	0.27	3/17/2005 10:54	3/17/2005 10:54
21FLPNS 330148	Eleven Mile Creek--WBID 489-15	1	0.55	0.55	0.55	0	0.55	3/28/2005 11:45	3/28/2005 11:45
21FLPNS 330148	Eleven Mile Creek--WBID 489-16	1	0.02	0.02	0.02	0	0.02	3/28/2005 12:49	3/28/2005 12:49
21FLPNS 330148	Eleven Mile Creek--WBID 489-17	1	0.03	0.03	0.03	0	0.03	3/28/2005 13:30	3/28/2005 13:30
21FLPNS 330148	Tributary to Eleven Mile Creek @ Turtle Pond	1	0.02	0.02	0.02	0	0.02	3/28/2005 11:15	3/28/2005 11:15
21FLPNS 330148	Eleven Mile Creek--WBID 489-5	1	0.15	0.15	0.15	0	0.15	9/12/2005 11:16	9/12/2005 11:16

6.1.2 Dissolved Oxygen and Biochemical Oxygen Demand

There are several factors that affect the concentration of dissolved oxygen (DO) in a waterbody. Oxygen can be introduced by wind, diffusion, photosynthesis, and additions of higher DO water (e.g. from tributaries). Dissolved oxygen concentrations are lowered by processes that use up oxygen from the water, such as respiration and decomposition, and by additions of water with lower DO (e.g. swamp or groundwater). Natural dissolved oxygen levels are a function of water temperature, water depth and velocity, and relative contributions of groundwater. Warm water holds less oxygen than cool water, and slower-flowing, less turbulent water has less diffusion of atmospheric oxygen into it. Because it is not in contact with air, groundwater naturally has lower concentrations of oxygen dissolved in it. Decomposition of organic matter, such as dead plants and animals, also uses up dissolved oxygen. Biochemical oxygen demand (BOD) is a measure of the amount of oxygen used by bacteria as they stabilize organic matter.

DO levels naturally fluctuate over the course of a day. Respiration and decomposition may consume oxygen dissolved in the water. During daylight, submerged aquatic plants take up carbon dioxide and produce oxygen as by-products of photosynthesis. At night, photosynthesis does not occur and so the oxygen-consuming processes dominate. The available data indicate that the DO concentrations in Elevenmile Creek are frequently below the Class III Freshwater Water Quality Criterion of 5.0 mg/L (Figure 6-2). Dissolved oxygen values measured between 1994 and 2006 range from 0.08 to 10.5 mg/l, with an average of 5.1 mg/l and a median of 5.07 mg/l. It should be noted almost all of the stations in the upstream segments of Elevenmile Creek do not attain the water quality criterion. The measurements for the individual stations in Elevenmile Creek for DO are presented in Table 6-6

Table 6-6 Dissolved Oxygen Elevenmile Creek (WBID 489)

Station ID	Station Name	#Obs	Mean	Minimum	Maximum	Exceeden	Median	First Date	Last Date
21FLA 3301001	11 MILE CREEK SR 186 ST REGIS EF	2	5.87	4.59	7.15	50	5.87	4/27/1995 11:00	10/31/1996 12:43
21FLA 3301001	11 MILE CREEK AT SR 297A BR	5	5.11	1.56	8.16	40	5.06	4/30/1995 13:50	10/31/1996 21:30
21FLA 3301001	11 MILE CR AT HWY 90 BR	1	6.96	6.96	6.96	0	6.96	4/30/1995 22:44	4/30/1995 22:44
21FLA 3301001	TRIB TO 11MILE CR AT 297A S OF ESC.CO RD PRI	1	5.76	5.76	5.76	0	5.76	10/31/1996 11:29	10/31/1996 11:29
21FLA 3301004	11 MILE CREEK 800 YDS ABOVE MOUT	9	2.45	0.08	4.5	100	3.2	4/25/1994 12:45	10/18/1994 11:09
21FLA 3301004	11 MILE CR 300 YDS N. HWY 186	1	5	5	5	0	5	10/31/1996 18:04	10/31/1996 18:04
21FLA 3301004	11 MILE CREEK 15 YARDS N OF SR18	1	7.59	7.59	7.59	0	7.59	10/31/1996 13:50	10/31/1996 13:50
21FLBFA 330100	11 MILE CREEK AT SR 297A BR	62	4.95	1.53	8.65	54.84	4.76	3/6/1994 11:00	5/7/2006 13:15
21FLBFA 330100	11 MI CR 1/2 MI BELO SAUFLEY FLD	13	5.68	3.8	8	38.46	5.34	3/6/1994 15:00	6/1/1997 11:35
21FLBRA 489-A	489 - Elevenmile Creek - at 297A and 97A junction	2	2.22	1.43	3	100	2.22	5/16/2006 10:57	6/27/2006 15:47
21FLBRA 489-B	489 - Elevenmile Creek - At Kingsfield	2	8.58	7.68	9.48	0	8.58	5/16/2006 12:33	6/27/2006 16:12
21FLBRA 489-C	489 - Elevenmile Creek - at US-90A	2	4.01	2.81	5.21	50	4.01	5/16/2006 14:30	6/27/2006 14:58
21FLBRA 489-D	489 - Elevenmile Creek - at US-90	1	2.5	2.5	2.5	100	2.5	6/27/2006 12:59	6/27/2006 12:59
21FLGW 17366	NWD-SL-1006 UNNAMED LAKE	2	9.06	8.92	9.2	0	9.06	4/2/2003 11:00	4/2/2003 11:00
21FLGW 17373	NWD-SL-1015 UNNAMED LAKE	1	6.97	6.97	6.97	0	6.97	5/12/2003 13:44	5/12/2003 13:44
21FLGW 3565	ELEVENMILE CREEK NEAR WEST PENSACOLA	112	5.12	1.9	9.28	50	4.98	10/20/1998 12:45	6/23/2006 17:49
21FLPNS 330100	11 MILE CREEK @ SR 297A Bridge	4	5.1	1.61	7.27	25	5.76	3/5/2005 8:00	6/12/2006 12:00
21FLPNS 330100	Eleven Mile Creek at Hwy 90A	2	7.5	7.38	7.62	0	7.5	3/17/2005 10:19	12/20/2005 13:48
21FLPNS 330100	Eleven Mile Creek at Highway 90 Bridge	6	6.25	3.23	10.05	33.33	5.65	3/17/2005 11:55	6/12/2006 13:30
21FLPNS 330100	Elevenmile Creek 500 Yards from Mouth	2	6.15	5.34	6.95	0	6.15	3/29/2005 12:14	9/12/2005 11:16
21FLPNS 330100	Eleven Mile Creek 1700 Yards above Mouth	1	5.19	5.19	5.19	0	5.19	9/12/2005 11:00	9/12/2005 11:00
21FLPNS 330100	Eleven Mile Creek @ Hwy 186 Cantonment STP (remc	1	3.09	3.09	3.09	100	3.09	6/12/2006 11:29	6/12/2006 11:29
21FLPNS 330100	Eleven Mile Creek--WBID 489-10	1	8.41	8.41	8.41	0	8.41	3/17/2005 10:54	3/17/2005 10:54
21FLPNS 330148	Eleven Mile Creek--WBID 489-17	1	9.9	9.9	9.9	0	9.9	12/20/2005 12:34	12/20/2005 12:34
21FLPNS 330148	Tributary to Eleven Mile Creek @ Turtle Pond	1	10.01	10.01	10.01	0	10.01	3/28/2005 10:15	3/28/2005 10:15

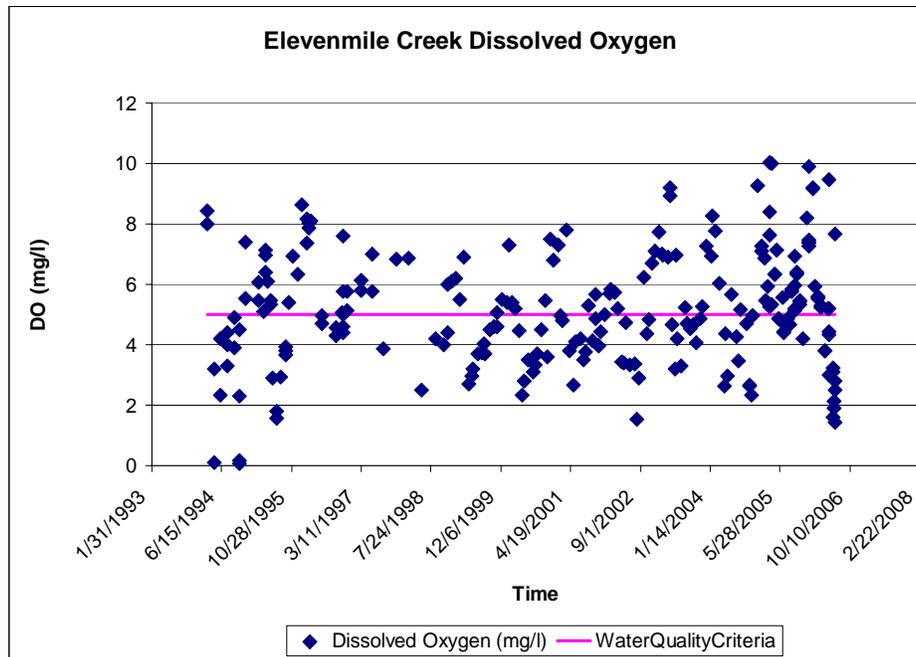


Figure 6-2 Dissolved Oxygen measurements in Elevenmile Creek

Biochemical oxygen demand is a measure of the amount of oxygen consumed by organisms in breaking down organic material. BOD ranges from 0.5 mg/l (below the Method Detection Limit) to 30.8 mg/l, with an average of 9.3 mg/l, and a median of 7 mg/l (Figure 6-3). The measurements for the individual stations in Elevenmile Creek for BOD are presented in Table 6-7. It should be noted that the BOD is high due to a point source discharger that has been working with FDEP to either change outfall location or add additional treatment.

Table 6-7 BOD Elevenmile Creek (WBID 489)

Station ID	Station Name	#Obs	Mean	Minimum	Maximum	Exceeden	Median	First Date	Last Date
21FLA 33010011	11 MILE CREEK AT SR 297A BR	2	9	6	12	100	9	7/16/1995 13:50	2/15/1996 21:30
21FLBFA 33010011	11 MILE CREEK AT SR 297A BR	64	11.63	2.8	30.8	100	9.6	3/6/1994 11:00	5/7/2006 13:15
21FLBFA 33010014	11 MI CR 1/2 MI BELO SAUFLEY FLD	14	5.51	0.5	11.6	92.86	5.45	3/6/1994 15:00	6/1/1997 11:35
21FLBRA 489-A	489 - Elevenmile Creek - at 297A and 97A junction	2	10.65	8.3	13	100	10.65	5/16/2006 10:57	6/27/2006 15:47
21FLBRA 489-B	489 - Elevenmile Creek - At Kingsfield	2	2.2	2	2.4	50	2.2	3/16/2006 12:33	6/27/2006 16:12
21FLBRA 489-C	489 - Elevenmile Creek - at US-90A	2	9.4	7.8	11	100	9.4	5/16/2006 14:30	6/27/2006 14:58
21FLBRA 489-D	489 - Elevenmile Creek - at US-90	1	9.5	9.5	9.5	100	9.5	6/27/2006 12:59	6/27/2006 12:59
21FLPNS 33010011	11 MILE CREEK at SR 297A Bridge	4	10.23	1.9	14.4	75	12.3	3/5/2005 8:00	6/12/2006 12:00
21FLPNS 33010012	Eleven Mile Creek at Hwy 90A	2	9.2	4.4	14	100	9.2	3/17/2005 10:19	12/20/2005 13:48
21FLPNS 33010013	Eleven Mile Creek at Highway 90 Bridge	6	4.7	1	9.8	66.67	4.8	3/17/2005 11:55	6/12/2006 13:30
21FLPNS 33010040	Elevenmile Creek 500 Yards from Mouth	2	2.6	2	3.2	50	2.6	3/29/2005 12:14	9/12/2005 11:16
21FLPNS 33010041	Eleven Mile Creek 1700 Yards above Mouth	1	1.4	1.4	1.4	0	1.4	9/12/2005 11:00	9/12/2005 11:00
21FLPNS 33010093	Eleven Mile Creek @ Hwy 186 Cantonment STP (removed) Outfall	1	13.7	13.7	13.7	100	13.7	6/12/2006 11:29	6/12/2006 11:29
21FLPNS 33010105	Eleven Mile Creek--WBID 489-10	1	5.6	5.6	5.6	100	5.6	3/17/2005 10:54	3/17/2005 10:54
21FLPNS 330148915	Eleven Mile Creek--WBID 489-15	1	7	7	7	100	7	3/28/2005 10:44	3/28/2005 10:44
21FLPNS 330148916	Eleven Mile Creek--WBID 489-16	1	0.8	0.8	0.8	0	0.8	3/28/2005 11:49	3/28/2005 11:49
21FLPNS 330148917	Eleven Mile Creek--WBID 489-17	2	0.85	0.7	1	0	0.85	3/28/2005 12:30	12/20/2005 12:34
21FLPNS 330148921	Tributary to Eleven Mile Creek @ Turtle Pond	1	1.7	1.7	1.7	0	1.7	3/28/2005 10:15	3/28/2005 10:15
21FLPNS 33014895	Eleven Mile Creek--WBID 489-5	1	2.2	2.2	2.2	100	2.2	9/12/2005 10:40	9/12/2005 10:40

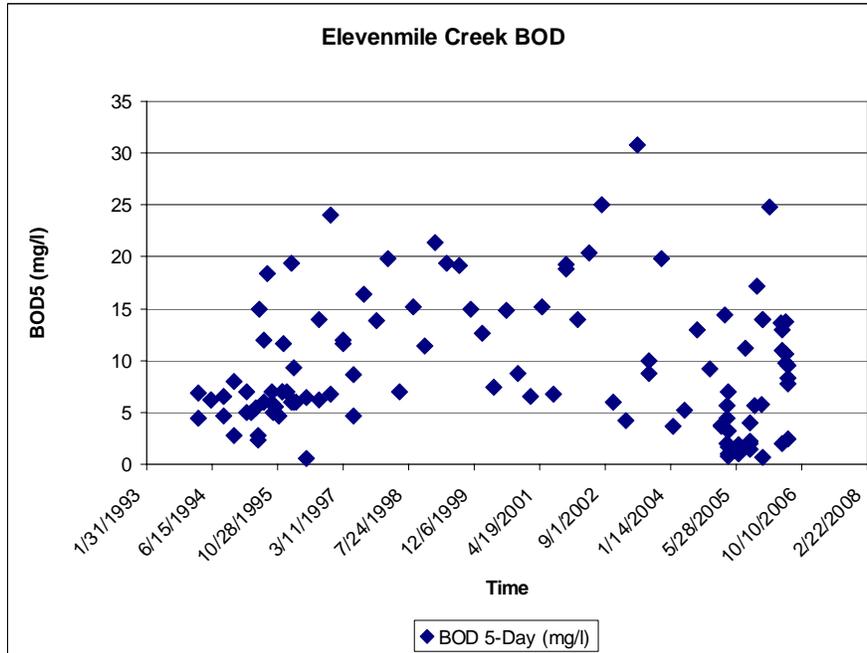


Figure 6-3 BOD Measurements in Elevenmile Creek

6.2 Previous Studies

Extensive modeling studies have been conducted to assist in the development of justification for NPDES permit limits for International Paper (Hydroqual, 2004). A technical memorandum of this modeling study is available as part of the administrative record. The modeling study and extensive field survey data indicate surface layer DO levels in lower Elevenmile Creek are calculated/measured to be below the State water quality standard whether or not the point source is discharging. The calculated surface layer minimum DO levels, presented in Table 6-8, are similar for whether there is no IP discharge or discharges into an adjacent wetland. This clearly indicates that dissolved oxygen concentrations do not attain the water quality criterion and are naturally low.

Table 6-8 Predicted Dissolved Oxygen Concentrations in Elevenmile Creek

Casee	Minimum DO	
	1989	1990
No IP Discharge	2.68	1.75
Wetland Discharge	2.68	1.67

Figure 6-4 - Figure 6-5 illustrate model predictions for Elevenmile Creek and Perdido Bay, it should be noted with and without anthropogenic sources, dissolved oxygen never attains the water quality standard.

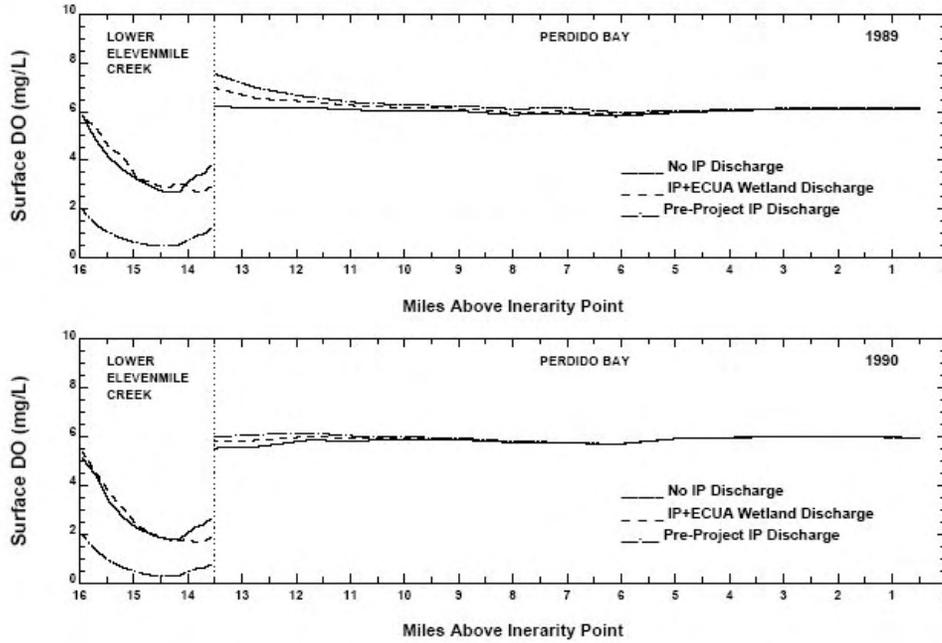


Figure 6-4 Predicted Surface Dissolved Oxygen Concentrations

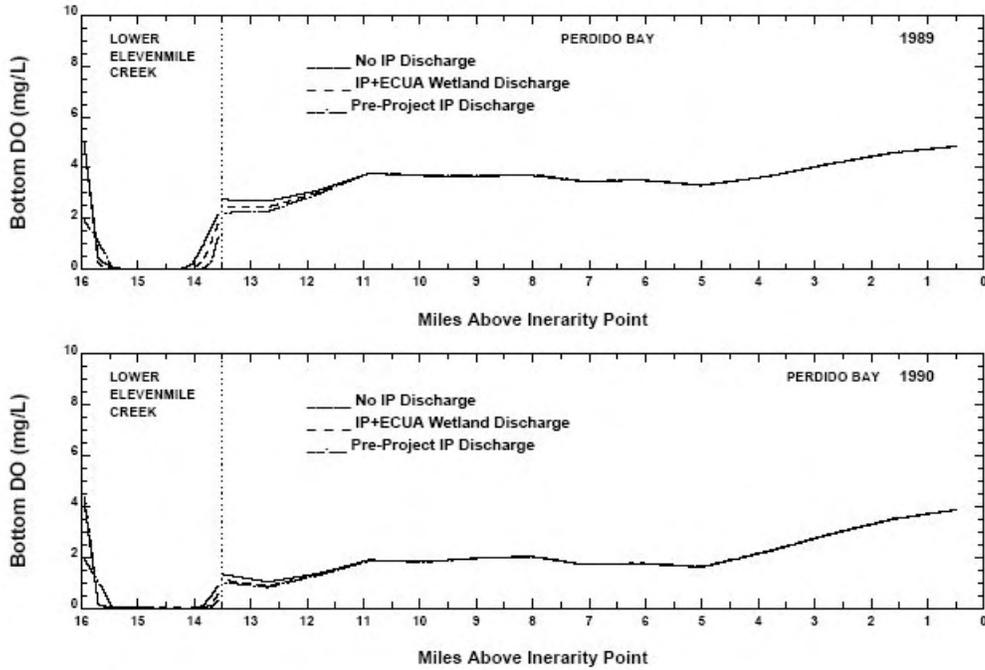


Figure 6-5 Predicted Bottom Dissolved Oxygen Concentrations

6.3 Determination of Background Concentrations

Background concentrations were determined from the work done by HydroQual (2004). Model predictions for 1989-90 years were used to calculate average annual concentrations for total nitrogen, total phosphorus and BOD. These values are presented in Table 6-9.

Table 6-9 Average Background Concentrations for Elevenmile Creek

	TN (mg/l)	TP (mg/l)	BOD (mg/l)
1989	0.81	0.06	3.57
1990	0.66	0.06	4.74
Average	0.74	0.06	4.2

7 Total Maximum Daily Loads

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and in-stream water quality conditions. A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), non-point source loads (Load Allocations), and an appropriate margin of safety (MOS), which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\text{TMDL} = \Sigma \text{WLAs} + \Sigma \text{LAs} + \text{MOS}$$

The objective of a TMDL is to allocate loads among the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time (e.g. pounds per day), toxicity, or other appropriate measure.

The DO target for Elevenmile Creek is Florida's applicable water quality standard for DO criteria of 5 mg/L. EPA notes, however, that it is likely the Creek will not attain the applicable water quality standard for DO, even if the nutrient and BOD loads established in this TMDL are met. EPA believes that the nutrient and BOD targets for this TMDL, which are based on a consideration of natural levels of nutrients and BOD, limits both these constituents so that they do not exert a negative effect on DO, as required by Florida's narrative criterion. See 62-302.530(48)(a), and 2-303.530(12), FAC. Limiting nutrients and BOD beyond this point is not expected to have any additional beneficial effect on DO. Therefore, EPA is proposing a load allocation and wasteload allocation equal to the current background condition in Elevenmile Creek Table 7-1. A revised DO criterion (SSAC) for Elevenmile Creek should be considered by FDEP to recognize that DO is naturally low in this Creek. Furthermore, the assigned background concentrations for total nitrogen will achieve the State's water quality criterion for unionized ammonia.

Table 7-1 TMDL components for WBID 489 (Elevenmile Creek)

Parameter	WLA	LA
Total Nitrogen	0.74 mg/l	0.74 mg/l
Total Phosphorus	0.06 mg/l	0.06 mg/l
Biochemical Oxygen Demand (BOD)	3.5 mg/l	4.2 mg/l

Note: For these TMDLs, it is not possible to estimate the daily loads due the lack of flow data. However, in order to calculate a daily load, multiply the TMDL concentration by the daily flow and appropriate conversion factors.

7.1 Waste Load Allocation

As set above, EPA believes Elevenmile Creek is naturally below the applicable water quality standard for dissolved oxygen without anthropogenic sources. While this TMDL does not propose loads to abate that natural condition, there is no assimilative capacity available in the Creek for a

nutrient or BOD wasteload allocation above natural background conditions. A revised DO criterion (SSAC) for Elevenmile Creek should be considered by FDEP to determine whether there is some amount of these constituents, above natural background, that can be added to the Creek while still protecting its designated uses.

7.2 Load Allocation

Similarly, there is no assimilative capacity available in the Creek for a nutrient or BOD load allocation above natural background conditions. A revised DO criterion (SSAC) for Elevenmile Creek should be considered by FDEP to determine whether there is some amount of these constituents, above natural background, that can be added to the Creek while still protecting its designated uses.

7.3 Margin of Safety

TMDLs shall include a margin of safety (MOS) that takes into account any lack of knowledge about the pollutant loading and in-stream water quality. There are two methods for incorporating a MOS in the analysis: 1) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or 2) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. An implicit MOS was used in these TMDLs because the conservative assumptions used in the water quality model.

7.4 Seasonal Variation

The use of two years of model predictions to determine annual average concentrations takes into account seasonal variation in loads and water quality responses.

REFERENCES

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Florida Department of Environmental Protection (FDEP), 2005, *Water Quality Status Report, Withlacoochee*, DEP Division of Water Resource Management, Southwest District, Group 4 Basin.

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HydroQual (2004). Technical Memorandum: Water Quality Modeling of Perdido Bay and Elevenmile Creek.

USEPA, 1991. *Guidance for Water Quality –based Decisions: The TMDL Process*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001, April 1991.

APPENDIX A WATER QUALITY DATA REMARK CODES

Table A- 1. Guide to Water Quality Remark Codes (Rcode column in data tables)

Remark Code	Definition
A	Value reported is mean of two or more samples
B	Result based on colony counts outside the acceptable range
E	Extra sample taken in compositing process
I	The value reported is less than the practical quantification limit and greater than or equal to the method detection limit.
K	Off-scale low. Actual value not known, but known to be less than value shown
L	Off-scale high. Actual value not known, but known to be greater than value shown
Q	Sample held beyond normal holding time
T	Value reported is less than the criteria of detection
U	Material was analyzed for but not detected. Value stored is the limit of detection.
<	NAWQA – actual value is known to be less than the value shown